

A NEW SHORELINE CHANGE DATABASE FOR THE MACKENZIE-BEAUFORT REGION, NWT, CANADA

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Recent oil industry activity in the Mackenzie Delta region of the Canadian Beaufort Sea has resulted in new demands on the Government of the Northwest Territories to develop a framework for managing the coast. This requirement demands updated data on coastal dynamics in the region. The Beaufort Sea coast is transgressive with typical average shoreline recession rates in the range of 1-2 m per year, however rates are known to be very variable both in space and in time. Past efforts used analog methods to analyze coastal change on a regional basis by comparing features on air photos taken in the late 1940s and early 1950s with an air photo survey from 1972. Since then regional air photo surveys were flown in 1985 and 2000. The 2000 survey used differential GPS for positioning and is therefore the most accurate base map available for updating measurements of coastal change. Digital orthoimages of the 2000 photos at a resolution 1.25 m were used to georeference 1985 photography and the shoreline and cliff edges were digitized for both years. Root mean square errors and comparison of features which were known to remain constant indicate that georeferencing was accurate to within 10 m. Measurements of coastal change were made every 100 m along the year 2000 (Y2K) shoreline. Shoreline change along the exposed coastal areas varied from -338 m to +68 m (negative change refers to retreat or erosion) over the 15 year period. Much of the exposed coastal regions are experiencing average erosion rates of -1 to -5 m a⁻¹. A large zone of stable coast line is associated with an intertidal sand flat deposited in the lee of several islands at the mouth of one of the major Mackenzie distributaries. The nearshore in this region is shallow (< 2 m) and a series of 5 or more shoreface bars create an extremely dissipative environment despite exposure toward the NW storm direction. The highest rates of retreat (> 10 m a⁻¹) are associated with spits or low tundra bluffs which are directly exposed to waves and storm surges caused by the northwesterly wind storms. Shoreline retreat rates are also quite high (5-10 m a⁻¹) in areas where coastal mapping has identified high ground ice content.

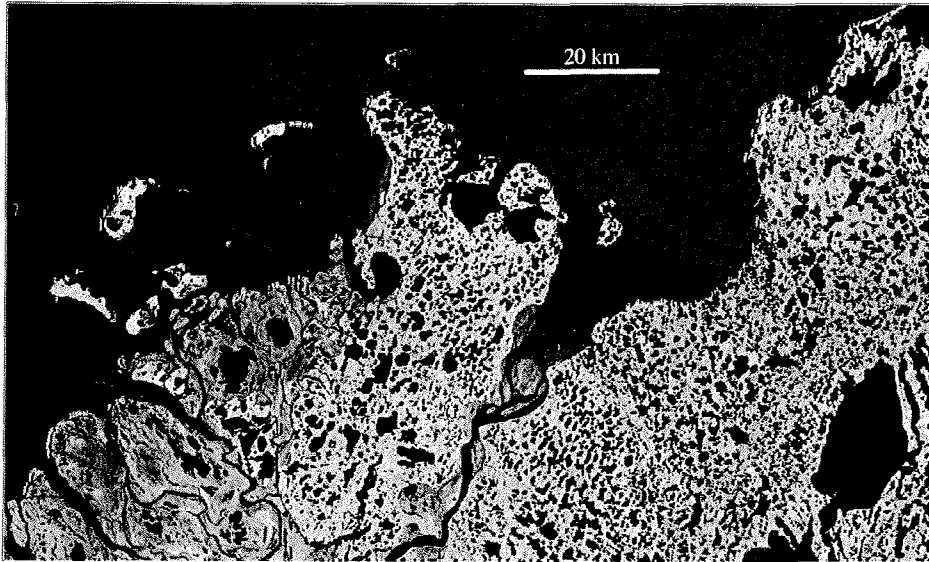


Figure 1. White dots are measured shoreline retreat locations where rates have exceeded 2 m a⁻¹ between 1985 and 2000.